Picture of the Week: A powerful cosmic particle accelerator

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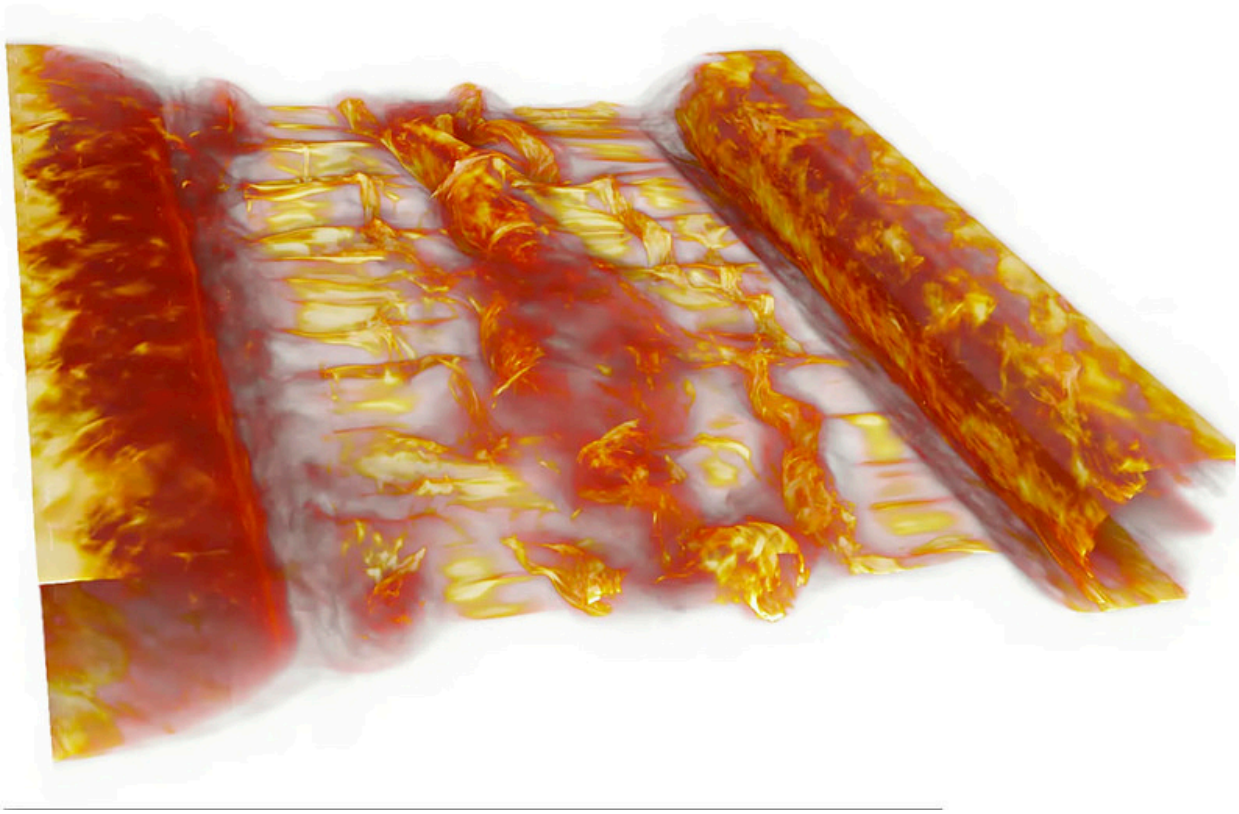

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A powerful cosmic particle accelerator

Magnetic reconnection is a fundamental process in physics, the continuous breaking and rearrangement of magnetic field lines in a plasma. During this process plasma gets energized in the changing magnetic field. Understanding reconnection phenomena has broad implications in how Earth's magnetosphere functions, how astrophysical jets accelerate particles, and how solar flares and coronal mass ejections work, and may eventually help us protect astronauts, communications satellites, and electrical power grids from the effects of these types of massive geomagnetic storms. This 3D simulation

shows how instabilities in the reconnection layer lead to multiple flux rope structures and turbulent magnetic fields.

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For decades, astrophysical and laboratory plasma physicists have speculated about whether magnetic reconnection can accelerate energetic charged particles in magnetically dominated systems when a huge amount of the magnetic energy is suddenly unleashed. New research from T-2 Astrophysics at Los Alamos National Laboratory indicates that magnetic reconnection is a credible mechanism for the production of cosmic rays and high-energy emissions. NASA's newly launched magnetospheric multi-scale spacecraft can test many aspects of the theory. The efficient acceleration may explain the gamma-ray emission from high-energy astrophysical systems such as pulsar wind nebulae and relativistic jets from supermassive black holes detected by the LANL-led High Altitude Water Cherenkov (HAWC) Observatory.